Study of Pragmatic Skills of Persian-speaking Adults with Autism Spectrum Disorder Based on the Persian Version of Montreal Protocol for the Evaluation of Communication (P.M.E.C.)

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Abstract

Background: Various studies have shown that individuals with autism spectrum disorder (ASD) experience significant cognitive impairments during childhood. Individuals often experience various language disorders that can manifest in different ways. There are also studies indicating that these impairments persist into adulthood for individuals with ASD. This study aimed to evaluate and identify cognitive impairments among Persian-speaking adults with ASD.

Methods: This research is of a quantitative nature and has been conducted using an experimental method in which two subtests from the Persian Version of the Montreal Protocol for the Evaluation of Communication (P.M.E.C.), including the Metaphor Interpretation and Speech Act Interpretation subtests, were utilized. Thirteen Persian-speaking men with ASD participated in this research, with ages ranging from 25 to 44 years (mean age 32.84, standard deviation 4.17), whose educational levels varied from primary school to 20 years of formal education. The control group consisted of 26 healthy Persian-speaking men who were matched in terms of age and educational level with the ASD group. The Kolmogorov-Smirnov test and a paired t-test were used to compare the two groups.

Results: The results indicated that the ASD group performed significantly poorer in both the Metaphor Interpretation subtest ($P < 0.001$) and the Speech Act Interpretation subtest ($P = 0.033$) compared to the healthy control group, suggesting cognitive impairments in their abilities.

Conclusion: The findings of this research can be valuable for assessment and intervention purposes in rehabilitation centers, as well as in academic and research settings.

Keywords: Autism Spectrum Disorder, Persian Language, P.M.E.C. Protocol, Cognitive Skills, Metaphor Comprehension, Speech Act Interpretation

Introduction

The relationship between language and the human brain, as a complex and fascinating topic, has always been the subject of scrutiny and investigation by scholars in various scientific domains. In this regard, neurolinguists seek to

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↑What is "already known" in this topic:
Autism spectrum disorder (ASD) refers to a cluster of developmental conditions impacting the nervous system. Key features, such as challenges in social and communicative interactions, repetitive actions, and limited areas of interest, identify these conditions.

→What this article adds:
The article introduces different methods for evaluating the Pragmatic Skills of Persian-speaking Adults with Autism Spectrum Disorder. The findings from this research revealed notable differences in performance between the ASD group and the healthy control group.

provide empirical and clinical evidence to answer the fundamental question of how language representation, processing, and learning occur in the brain. In neurolinguistic research, three main objectives are pursued: a) identification of neural structures involved in language functions, b) examination and evaluation of various linguistic and cognitive impairments to better understand the normal functioning of language in the brain and find therapeutic solutions, and c) the validation of linguistic theories regarding the nature of human language.

In the quest for a better and more precise understanding of the link between language and the brain, neurolinguists have examined language disorders resulting from neurological impairments, such as autism. Autism spectrum disorder (ASD) is a group of developmental disorders affecting the nervous system, characterized by a group of primary manifestations, including deficits in social and communicative interactions, repetitive behaviors, and restricted interests. Some common language-related challenges seen in individuals with ASD include Delayed Language Development, Echolalia, Pragmatic Language Difficulties, Literal Interpretation, Difficulty with Nonverbal Communication, Idiosyncratic Language Use, Repetitive or Restricted Language Patterns and Selective Mutism (1). The main social deficits in autism include poor eye contact, lack of emotions or social reciprocity, language impairments, and age-inappropriate social interactions (2). The disorder was first described by Leo Conner in Baltimore in 1943 and a year later in Vienna by Hans Asperger, and after that, several theories were presented to explain the mystery of autism (3). Due to the existence of individual differences and the severity of the disease, autism includes a range of disabilities, from mild to severe autism. At one end of this spectrum are patients with an IQ below 40, and at the other end are geniuses with high intellectual abilities, although they also have defects in social and communication interactions (4). In addition, in terms of language development, there are many individual differences among people with autism. Some of them never speak in their lifetime, while others, although they speak fluently, face problems in understanding and using language (5). The prevalence of autism in boys is nearly 1 in 42, while in girls, it is 1 in 189, with boys being four times more likely to be affected (6). According to the World Health Organization's statistics, the estimated global prevalence of autism in 2014 was approximately 2.2%, roughly three times higher than the number in 2000 (7). Approximately two-thirds of adults with autism have severe disabilities and spend their entire lives dependent on their families and specialized institutions (8). Given the rapid and progressive increase in the prevalence of autism, coupled with its complex nature, understanding how language and the brain are connected in these individuals is of paramount importance for early intervention and improving their quality of life.

The assessment of language disorders in individuals with autism often involves the use of various tests and scales, such as the Gilliam Autism Rating Scale - Third Edition (GARS-3) (9), the Autism Diagnostic Interview-Revised (ADI-R, the Gilliam Asperger's Disorder Scale, and autism screening tools for education, etc) (10). These assessments

are specifically designed to evaluate linguistic information in individuals with autism, such as phonology, semantics, morphology, and syntax. However, to measure discursive, pragmatic, lexical-semantic, and prosodic skills, specific tools designed to assess these skills are required. Specialized assessment tools for language disorders in ASD are crucial because they are specifically designed to account for the unique communication challenges presented by individuals on the autism spectrum. These tools offer a more comprehensive and accurate evaluation, leading to better-informed intervention strategies tailored to the individual's needs. To address this need, the Montreal Protocol for Evaluation of Communication (MEC) was developed in French (11) to initially assess the communicative abilities of patients with right hemisphere brain damage; it was later used to evaluate the communication skills of individuals with various brain injuries (12). The MEC aims to assess four communicative skills: discursive, pragmatic, lexical-semantic, and prosodic. In this study, we aim to evaluate the pragmatic performance of Persian-speaking adults with autism using the Persian version of the Montreal Protocol for Evaluation of Communication (P.M.E.C.) (12, 13). The data obtained from such research can provide clinical professionals with a richer scientific understanding to develop more effective therapeutic programs.

Previous studies have delved into this area. Some studies show that in all cases, there were significant differences between the control group and children with autism in features such as consonant deletion, vowel insertion, vowel displacement, stress, intonation, speech rhythm, grammatical tense, subject-verb agreement, prepositions, negations, plural nouns, demonstrative pronouns, compound sentences, idiom comprehension, Gricean principles, echolalia, discourse coherence, and body movements were investigated, with the latter showing poorer performance (13, 14).

Some research indicates that the developmental sequence of different linguistic dimensions in children with autism is similar to typically developing children, but children with autism exhibit delayed development in these areas (15). Also, the studies conducted using the MEC protocol indicate that both the right and left hemisphere-damaged groups perform weaker in phonological, lexical-semantic, discursive, and pragmatic skills (16, 17).

Many foreign researchers have also focused on studying autism and its language impairments. The findings of many of these studies indicate that individuals with autism often confuse polite and familiar forms of address; they sometimes use overly polite language (18). In addition, individuals with autism who successfully passed first-order theory of mind tests were capable of understanding metaphors, while only those who passed second-order theory of mind tests could comprehend irony (19). The implicit interpretation of words and utterances is common in individuals with autism (20).

The autism and control groups had similar performance in understanding novel metaphors, despite individuals with autism using creative metaphors, while individuals with autism had a slight advantage in understanding conventional metaphors and a tendency to produce novel metaphors (21).

In addition, some investigation asserts that conversational skills do not correlate with general language abilities but were effective in assessing pragmatic skills, suggesting that language deficits in conversational skills may reflect variations and shortcomings in the interactions of children with autism (22). Oral language comprehension and social cognition also play a significant role in the reading comprehension of individuals with autism (23).

Some studies results indicated that core language skills are essential in figurative comprehension and that intervention programs designed for social communication skills can also be effective in language skills (24, 25).

Methods

Participants

This research is of a quantitative nature and has been conducted using an experimental method. The study population consisted of Persian-speaking adults with autism. The sample group was selected purposefully from available samples in speech therapy centers, the Tehran Autism Society, exceptional centers, and the Tehran Welfare Organization. Since these centers accepted children and adolescents with autism, and considering that the current research aimed to assess language disorders in adults with autism, these centers were asked to provide files of individuals who had been diagnosed with autism in previous years and were now in the age range of the current study (25-44 years old). Telephone contact was made with many of them, but unfortunately, either their contact information had changed, or they were not willing to participate in the research. In the end, after reviewing the inclusion and exclusion criteria, 13 individuals with autism were selected for the research.

Adults aged 25 to 44 years, whose native language was Persian, and who were confirmed to have autism based on their clinical files, were eligible to participate in the study. Individuals with a history of psychiatric and neurological disorders other than autism, alcoholism, uncorrected hearing or vision impairments (without hearing aids, glasses, or lenses), damage to the left hemisphere of the brain, and those with a history of participating in speech therapy sessions, were excluded from the research. Ultimately, 13 men with autism, aged between 25 and 44 years (with a mean age of 32.84 and a standard deviation of 4.17), and with educational backgrounds ranging from primary school to 20 years of formal education, remained in the study. Twice

the number of individuals with autism, i.e., 26 participants without a history of brain injury, were included in the research as a control group. They were matched with the autism group in terms of age, gender, city of residence, native language, and educational history. The demographic information of individuals with autism in the current study is presented in Table 1.

Tools

In 2004, the Montreal Protocol for the Evaluation of Communication (MEC) was designed by Joanette and colleagues to assess the communication skills of right hemisphere-damaged patients in the French language. MEC is used to evaluate various aspects of language in children and adults. Joanette and colleagues introduced the purpose of this protocol as assessing four linguistic skills: discourse, pragmatic inferencing, lexical-semantic skills, and prosody (26). The P.M.E.C. has been standardized in several countries, including Canada, Argentina, France, Switzerland, the United States, Brazil, Italy, and Iran. In the present study, the Persian version of the P.M.E.C. protocol, abbreviated as Persian P.M.E.C., was standardized (27) and two subtests, Interpretation of Metaphor and Interpretation of Speech Acts, were used. The purpose of the metaphor interpretation subtest is to evaluate the ability to interpret the metaphorical meaning of sentences, and the purpose of the speech act interpretation subtest is to evaluate the ability to understand indirect speech acts based on the situational context.

The Interpretation of Metaphor subtest includes 10 idiomatic expressions in the Persian language and 10 new metaphors (20 metaphors). The participant must provide the correct meaning of each one.

The Interpretation of Speech Acts subtest consists of 20 situations. In 10 of them, the intended meaning of the stimulus sentence is the literal meaning based on the context, and in the other 10, the speaker intends something beyond the literal meaning of the sentence. The participant must explain the intended meaning of the stimulus sentence based on the specified context.

Procedure

After introducing individuals with autism by the Iranian Autism Society, Special Education, and Welfare Organization schools, and reviewing their clinical files, those whose

Table 1. Demographic Information of adults with autism

Row	Age	Education	Occupation	Age at Diagnosis
1	31	9th Grade	Café Worker	5 years old
2	41	9th Grade	Restaurant Delivery	3 years old
3	32	Technical Diploma	Copy Machine Technician	4 years old
4	26	4th Grade	Carpenter's Apprentice	5 years old
5	32	9th Grade	Janitor	3 years old
6	36	9th Grade	Pet Trainer	6 years old
7	30	Master's Degree	Private Company Engineer	7 years old
8	29	7th Grade	Building Painter	6 years old
9	26	10th Grade	Café Worker	3 years old
10	41	Bachelor's Degree	Art Teacher	5.2 years old
11	39	7th Grade	Restaurant Kitchen Work	4 years old
12	27	Master's Degree	Librarian	3 years old
13	37	5th Grade	Construction Worker	5 years old

diagnosis of autism had been confirmed by psychologists, psychiatrists, or specialists in this field and did not have exclusion criteria were entered into the research phase, which involved responding to the P.M.E.C. protocol. Data collection was carried out between April 2020 and August 2021 using convenience sampling. The individuals with autism or their companions signed a consent form to participate in the research. The individuals with autism were expected to answer the questions themselves, and if they had difficulty understanding the questions, one of their family members or acquaintances who were present explained them. Subsequently, two subtests of the P.M.E.C. protocol were administered, taking approximately 20 minutes. The responses of the patients and the control group were recorded using a SONY Stereo IC Recorder ICD-UX560F (manufactured in 2017, China) and were reviewed by the researcher to make corrections in scoring if necessary. The data obtained from the two subtests for both participant groups were initially entered into Microsoft Excel (2019) and then transferred to the SPSS software. Statistical analyses were conducted using a Lenovo laptop (G510i, Core i7, China). Given that the Kolmogorov-Smirnov test indicated the normal distribution of the data, a paired t-test was used to compare the two groups.

Results

Table 2 displays the statistical results related to the comparison between the control group and the adults with autism.

Based on the data in Table 2, it can be concluded that considering the p-value ($P < 0.001$) in the Interpretation of Metaphor subtest and the p-value ($P = 0.033$) in the Interpretation of Speech Acts subtest, there is a significant difference in performance between individuals with autism and the control group ($P < 0.05$). Therefore, it can be inferred that the performance of the test group in the Interpretation of Metaphor subtest is significantly weaker compared to the control group.

Discussion

This study aimed to evaluate the pragmatic skills of Persian-speaking adult individuals with autism using two subtests, Interpretation of Metaphor and Interpretation of Speech Acts, from the P.M.E.C. protocol (28, 29). The results indicated that participants with autism performed significantly worse than the control group in both the Interpretation of Metaphor and Interpretation of Speech Acts subtests. Individuals with autism may experience challenges in language development and communication due to various reasons related to the condition. Here are some factors that contribute to weaker language performance in individuals with autism: Social Communication Difficulties, Difficulty with Language Processing, Sensory Sensitivities, Delayed

Development of Language Skills, Repetitive Behaviors and Interests, Executive Functioning Challenges, and Co-occurring Conditions. Comparing the findings of this study with previous research, the following points can be highlighted:

1. The findings of the current study align with the research by Rouhparvar and Karami (2012), who found that children with autism have difficulty understanding the non-literal meanings of idiomatic expressions. Since their research focused on children and the present study focused on Persian-speaking adult individuals with autism, it may be inferred that this difficulty in comprehending the non-literal meanings of idiomatic expressions persists from childhood into adulthood in these individuals.

2. Torabi's study (2019) did not show a significant difference in interpretation between the two groups, individuals with right hemisphere damage and the control group, although the patient group performed poorly overall. The difference in results between that study and the present research could indicate the distinct nature of language impairments resulting from right hemisphere damage on one hand and autism spectrum disorder on the other. While it is well established that language impairments resulting from right hemisphere damage also include deficits in pragmatic skills, it should be noted that patients with right hemisphere damage, like those with autism spectrum disorder, do not form a homogeneous group, and there are significant within-group variations among them.

3. Contrary to Torabi (2019), Ariyanpour (2021) found a significant impairment in both subtests among patients with right hemisphere damage. While the discrepancy in results might be attributed to the wide within-group variations among patients with right hemisphere damage, the results of the present study align with those of Ariyanpour.

4. The results of the current study are consistent with Atwood's (2003) report of a boy who struggled to understand non-literal meanings of utterances. This similarity in pragmatic impairments can stem from autism spectrum disorder among Persian speakers and speakers of other languages.

5. Cassirer and Marshall (2014) did not find any differences in understanding novel metaphors between two groups: individuals with autism and the control group. These findings contrast with the present study's results. This discrepancy could be due to the heterogeneity in the occurrence of language and pragmatic impairments in individuals with autism spectrum disorder, as seen in Cassirer and Marshall's research.

6. The findings of Tamara Klandaz and her colleagues (2018), which indicate the poorer performance of autism spectrum disorder in understanding metaphors, align with the results of the present study, suggesting similarities in pragmatic impairments resulting from autism spectrum disorder among Persian speakers and speakers of other languages, as indicated in Atwood's (2003) report.

7. Saban-Bazargani et al.'s (2019) results also align with the findings of the current study, as both studies demonstrate the inability of individuals with autism to comprehend the indirect meanings of expressions. Similar to Rouhparvar and Karami (2012), it can be inferred here that this difficulty begins in childhood and persists into adulthood.

Table 2. Results of Paired T-test Comparing Two Groups for Pragmatic Skills Subtests

Pragmatic Skills Subtest	*P*-value
Interpretation of Metaphor	<0.001
Interpretation of Speech Acts	0.033

Conclusion

The findings of the present research indicate a significant impairment in understanding metaphors and indirect speech acts in adult Persian-speaking individuals with autism spectrum disorder (ASD). These pragmatics impairments can potentially hinder effective communication and lead to social difficulties, ultimately affecting their overall quality of life.

This study underscores the importance of addressing cognitive-communicative deficits in the assessment and treatment of individuals with ASD. By focusing on enhancing their pragmatic language skills and their ability to comprehend non-literal meanings, interventions and therapeutic approaches should aim to improve language and social functioning in individuals with ASD. These findings provide valuable insights for clinicians, educators, and caregivers, enabling them to develop more effective strategies for the education and support of individuals with ASD and create greater opportunities for their inclusion in society.

In conclusion, these results serve as a foundational basis for future research in the field of pragmatics impairments in individuals with ASD, emphasizing the need for continued investigation and intervention strategies to enhance the lives of individuals with ASD.

Ethical Approval Declarations

The tests were conducted in the workplace or place of residence of the individuals, depending on their preference. The present research was conducted under the supervision of the Ethics Committee of Iran University of Medical Sciences with the ethics code IR.IUMS.REC.1398.416.

Acknowledgment

This study was part of a PhD thesis. The authors would like to thank the anonymous reviewers for their valuable comments on the earlier draft of the paper.

Authors contributions

SZr, SR: Conceptualization, proposal drafting, Project administration, and validation; SZr: Data collection and curation; SZr, SR: Formal analysis, first drafting; MJ, AG: substantial commenting; SZr, SR, MJ, AG: final drafting, responsibility of the whole manuscript.

List of abbreviations

P.M.E.C.: Persian Version of Montreal Protocol for the Evaluation of Communication
ASD: Autism Spectrum Disorder

Conflict of Interests

The authors declare that they have no competing interests.

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